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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/422,887 10/21/99 FOGAL

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EXAMINER

MMC2/1116

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[ART/UNIT, J]

PAPER NUMBER

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11/16/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/422,887

Applicant(s)

FOGAL ET AL.

Examiner

J. L. Brophy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 August 2000.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 7-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☒ The proposed drawing correction filed on 28 August 2000 is: a) ☒ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

Attachment(s)

- 15) ☐ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 18) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: _____

DETAILED ACTION

This office action is in response to the amendment and drawings filed 8/28/00.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 12 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The limitation of "marginally clearing a line of sight..." is not defined in the specification and the meaning of the limitation is not clear.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 13-17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 13, the limitation "ensuring at most a minimum bond pad clearance..." is unclear. In claim 17, the limitation "less than a maximum underlying bond pad clearance..." is unclear. These limitations might indicate that a portion of the bond pad

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of an underlying chip is obstructed by the upper die. However, this is not shown or taught in the specification. Therefore, the above claim limitations are indefinite.

Please note that dependent claims are rejected because the independent base claims have been rejected.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 7 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Farnworth (5,012,323).

Re claim 7, Farnworth teaches a method of stacking a plurality of die including the steps of mounting an upper die (41) on a lower die (43) and defining a minimum angular offset with said mounting, wherein said minimum angular offset allows access to a bonding site (46) on the lower die (43). See Figs. 4 and 5 and col. 4, line 36 through col. 5, line 20.

Re claim 17, Farnworth teaches the steps of serially stacking all the dies (41, 43) and establishing a unique orientation for each die of said all dies (41, 43), wherein said orientation for each die defines an underlying bond pad clearance.

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Claims 7, 8, 12 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Sakurai (JP 57-31166A).

Re claim 7, Sakurai teaches a method of stacking a plurality of die (1a-1d) including the steps of mounting an upper die (1d) on a lower die (1c) and defining a minimum angular offset with said mounting, wherein said minimum angular offset allows access to a bonding site (2c) on the lower die (1c). See Figs. 2a and 2b and the second and third paragraphs of p. 4 of the translation.

Re claim 8, Sakurai teaches the step of mounting a lowest die (1a) on a substrate (4). See Fig. 3.

Re claim 12, Sakurai teaches the steps of stacking the plurality of dies (1a-1d) along an axis, establishing an orientation for each die of said plurality of dies, marginally clearing a line of sight to contact areas of any immediately underlying die with said orientation for said each die, wherein said line of sight is parallel to said axis and clearing a line of sight to contact areas of any underlying die with said orientation for said each die.

Re claim 17, Sakurai teaches the steps of serially stacking all the dies (1a-1d) and establishing a unique orientation for each die of said all dies (1a-1d), wherein said orientation for each die defines an underlying bond pad (2a-2d) clearance.

Claims 7, 8 and 12-17 are rejected under 35 U.S.C. 102(b) as being anticipated by de Givry (EP 0,489,643 A1).

Re claim 7, de Givry teaches a method of stacking a plurality of die (14, 16) including the steps of mounting an upper die (16) on a lower die (14) and defining a minimum angular offset with said mounting, wherein said minimum angular offset allows access to a bonding site (18) on the lower die (14). See Fig. 1 and p. 6 of the translation.

Re claim 8, de Givry teaches the step of mounting a lowest die (14) on a substrate (12). See Fig. 2.

Re claim 12, de Givry teaches the steps of stacking the plurality of dies (14, 16, 26, 28) along an axis, establishing an orientation for each die of said plurality of dies (14, 16, 26, 28), marginally clearing a line of sight to contact areas of any immediately underlying die with said orientation for said each die, wherein said line of sight is parallel to said axis, and clearing a line of sight to contact areas of any underlying die with said orientation for said each die (see Fig. 3 and p. 7 of translation).

Re claims 13 and 14, de Givry teaches the steps of spiraling the plurality of chips (14, 16, 26, 28) around an axis perpendicular to the plurality of chips (14, 16, 26, 28) and ensuring bond pad clearance to each chip of the plurality of chips (14, 16, 26, 28), wherein spiraling the plurality of chips further comprises spiraling the plurality of chips around an axis passing through each chip (Fig. 3).

Re claims 15 and 16, de Givry teaches that the step of spiraling includes spiraling the plurality of chips around an axis passing through the center of each chip and the step of ensuring bond pad clearance further comprises rotating a chip around the axis at least to the extent that a bond pad on an underlying chip is exposed (Fig. 3).

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Re claim 17, de Givry teaches the steps of serially stacking all the dies (14, 16) and establishing a unique orientation for each die of said all dies (14, 16) wherein said orientation for each die defines an underlying bond pad (18) clearance (Fig. 1 and p. 6 of the translation).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over de Givry in view of Sakurai.

De Givry teaches the steps of stacking all of the dies (14, 16), such that corresponding portions of any two of said dies define respective axes, and wherein said axes define an offset angle, and bonding wire (19) to the dies (14, 16).

However, de Givry does not teach that the bonding step is performed after all the dies have been stacked.

Sakurai teaches the steps of stacking the dies and then performing a wire bonding step after all of the dies have been stacked (Figs. 1 and 3).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to perform the bonding step after all the dies have been stacked so

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that only bonding step is performed, rather than performing a bonding step after each die is mounted, thereby reducing the number of steps.

Response to Arguments

Applicant's arguments with respect to claims 9-11 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments filed 8/28/00 have been fully considered but they are not persuasive.

Regarding the rejection of claim 7 under 35 U.S.C. 102(b) as being anticipated by Farnworth, Farnworth teaches that the upper die is smaller than the lower die. Thus, when the upper die is mounted on the lower die, an angular offset is defined between the edges of the upper and lower dies.

Applicant argues that Farnworth, Sakurai and de Givry do not disclose a "minimum" angular offset. The only defining feature of the "minimum angular offset" recited in claim 7 is that the minimum angular offset allows access to a bonding site on the lower die. Farnworth, Sakurai and de Givry do teach a minimum angular offset which allows access to a bonding site on the lower die.

Re claim 12, Applicant argues that the references do not teach the step of "marginally" clearing a line of sight. This argument is not persuasive because, as the 35 U.S.C. 112, first paragraph rejection above points out, the term "marginally" is not supported by the specification and is therefore unclear.

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Re claims 13-17, Applicant argues that de Givry does not teach "at most a minimum" or "less than a maximum" bond pad clearance. This argument is not persuasive because, as the 35 U.S.C. 112, second paragraph rejection above points out, the terms are not clear and are not defined in the specification.

Re claim 17, Applicant argues that Farnworth and Sakurai do not teach a "unique orientation" for each die in a multi-die device. However, the orientations of the dies 41, 43 shown in Fig. 5 of Farnworth can be interpreted as being "unique" since the dies are not in the same exact position, i.e., the upper die has a different vertical position than the lower die. The same argument can be applied to the Sakurai reference. In addition, in Fig. 2 of Sakurai, the dies have different vertical and horizontal positions.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to J. L. Davis whose telephone number is (703) 308-6182. The examiner can normally be reached on M-Th (7:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on (703) 308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3432 for regular communications and (703) 308-7382 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

J.L.D.

jld

November 9, 2000

Carl Whitehead, Jr.
CARL WHITEHEAD, JR.
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